LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Oct. 21-25, 2013.

The New York Times

'GOD' PARTICLE WINS A PRIZE

A Large Ion Collider Experiment, also known as ALICE, is a dedicated heavy-ion detector used to exploit the unique physics potential of nucleus-nucleus interactions at Large Hadron Collider energies.

The "God particle," aka the Higgs boson, became the prize particle recently when the theorists who developed the idea won the Nobel Prize in physics.

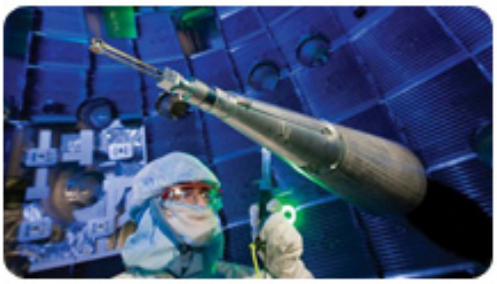
The Royal Swedish Academy of Sciences awarded the prize to theorists Peter Higgs and Francois Englert to recognize their work developing the theory of what is now known as the Higgs field, which gives elementary particles mass.

U.S. scientists, including researchers at Lawrence Livermore National Laboratory, played a significant role in advancing the theory and in discovering the particle that proves the existence of the Higgs field, the Higgs boson.

To read more, go to *The New York Times*.

BBC

A MILESTONE LIKE NO OTHER



Researchers at a Lawrence Livermore National Laboratory have passed a crucial milestone on the way to their ultimate goal of achieving self-sustaining nuclear fusion.

Harnessing fusion -- the process that powers the sun and the stars -- could provide an unlimited and cheap source of energy.

A breakthrough by scientists at the National Ignition Facility (NIF) could boost hopes of scaling up fusion.

To be viable, fusion power plants would have to produce more energy than they consume, which has proven elusive. During an experiment in late September, the amount of energy released through the fusion reaction exceeded the amount of energy being absorbed by the fuel -- the first time this had been achieved at any fusion facility in the world.
To read more, go to the BBC.

NewScientist

A BLAST FROM THE PAST

The highly distorted supernova remnant shown in this image may contain the most recent black hole formed in the Milky Way galaxy.

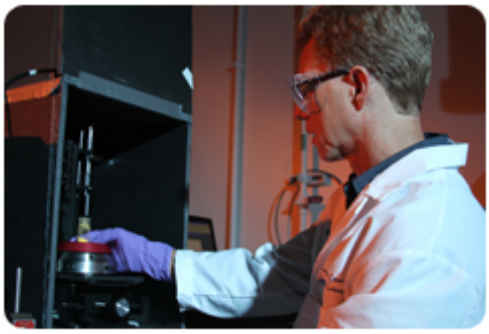
Remnants of an ancient supernova (the cataclysmic death of a star) have been found in some of the oldest known minerals in the solar system.

The chemical traces indicate that this particular supernova that likely occurred during the "Big Bang" happened nearby within a couple million years of the minerals' formation.

Most of the universe is filled with light elements like hydrogen and helium. The heavier stuff that makes up planets is forged inside stars or created when they explode as supernovae. But how such events affected the solar system is unclear.

Gregory Brennecka of Lawrence Livermore National Laboratory and his colleagues looked inside meteorites to find metal-rich bits of mineral, called inclusions, that formed about 4.5 billion years ago, before the planets congealed. The inclusions didn't have as many heavy isotopes as younger rocks from Earth, Mars or the moon. That means a supernova must have sprinkled heavier stuff on the solar system sometime between the formation of inclusions and the birth of planets.

To read more, go to *New Scientist*.



Greg Klunder, a chemist in LLNL's Forensic Science Center, examines a uranium ore concentrate sample (also known as yellowcake) with the aid of a near-infrared spectrometer.

A team of Lawrence Livermore National Laboratory researchers has pioneered the use of a long-standing technology for a new application -- analyzing the chemical composition of uranium samples.

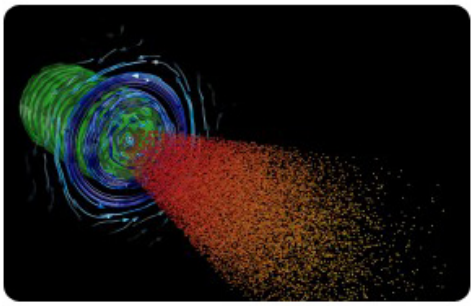
The Laboratory scientists describe the first reported use of near-infrared spectrometry to study the chemical properties of uranium ore concentrates (UOC), also called yellowcake.

Near-infrared spectrometers were first used in industrial applications in the 1950s and have been utilized for medical diagnostics, combustion research, pharmaceuticals and other uses, but not for studying uranium ore concentrates. The instrument measures the color, intensity and wavelength of light or reflected light.

This technology could rapidly provide information on the origin of uranium samples to law enforcement officials who interdict smuggled materials and could be useful in preventing future trafficking from those sources.

To read more, go to *Daily Fusion*.

DEXIS A STAR IS BORN



OSIRIS simulation on the Sequoia supercomputer shows the interaction of a fast-ignition-scale laser with a dense deuterium-tritium plasma.

Federico Fiuza, a postdoctoral fellow at Lawrence Livermore National Laboratory, is leading exhaustive computer modeling efforts to study a new approach to controlled fusion. He simulates the physics that fuel the sun, with an eye toward creating a controllable fusion device that can deliver abundant, carbon-free energy.

"It is critical to simulate these (fusion) systems as best we can before doing experiments," says Frederico Fiuza, who is in Livermore's Fusion Energy Sciences Program. "The complexity is so large and building and using these machines is so expensive that you need to know as best as you can what to expect."

Fiuza spent much of his recently completed doctoral research embellishing OSIRIS, a modeling code to tackle uncertainties surrounding what's called the fast-ignition approach to inertial-confinement fusion. He loaded OSIRIS on all cores of Sequoia, the Lab's IBM Blue Gene/Q, achieving what Livermore says is the biggest simulation ever with that kind of program.

To read more, go to *DEIXIS Magazine*.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send e-mail